REMARKS

Claims 1-10 are pending in the above-identified application. As shown above, claims 2, 5, and 7-9 are currently-amended, and claim 10 is newly added.

Claim 2 stands rejected under 35 U.S.C. § 102(b) as anticipated by *Nagel et al.* (U.S. Pat. No. 5,864,153). The claim describes a method for fabricating a capacitor such that:

> ... conditions of the chemical vapor deposition for forming the lower electrode and the upper electrode are controlled so that an oxygen concentration in the upper electrode is higher than that in the lower electrode.

As a result of this feature of the invention, the impurity concentration in the lower electrode can be lowered and the adhesion between the capacitor dielectric film and the upper electrode can be improved. (See applicants' specification, paragraph bridging pages 13-14.)

In *Nagel et al.*, the lower electrode layer 22A is made from Pt and the upper electrode layer 24A is made from $Ru_{1-x}O_x$, $x = 0.3$ (hereinafter RuOx). The Pt film is formed by sputtering. (Column 11, lines 34-36.) The RuOx film is formed by depositing the RuOx film by sputtering or by depositing a Ru film by sputtering and oxidizing the Ru film. (Column 11, line 46, to column 12, line 7.) Thus, in *Nagel et al.*, the lower electrode layer 22A and the upper electrode layer 24A are not formed by chemical vapor deposition as is the claimed invention. Further, oxygen concentrations in the lower electrode layer 22A and in the upper electrode layer 24A are not controlled by the conditions of the chemical vapor deposition as claimed.

Accordingly, because *Nagel et al.* does not disclose subject matter explicitly recited in claim 2, applicants request the withdrawal of the anticipation rejection.

Claims 1 and 3-9 stand rejected under 35 U.S.C. § 103(a) as obvious over *Nagel et al.* in view of *Won et al.* (U.S. Pat. No. 6,136,641). Applicants respectfully traverse this rejection.

Although it may be generally recognized that the thermal processing in a forming gas atmosphere performed after the formation of the capacitor improves the adhesion between the capacitor dielectric film and the upper electrode of the capacitor, when the upper electrode is made from a metal material such as Ru, Pt, *et cetera*, the thermal processing in the forming gas atmosphere performed after the formation of the capacitor degrades the electric characteristics of the capacitor.

The studies made by the inventors of the present invention make clear that the thermal processing performed after the deposition of the metal film and before patterning rather improves the electric characteristics of the capacitor. Thus, the invention provides an improvement in both the electric characteristics of the capacitor and the adhesion between the capacitor dielectric and the upper electrode (see, e.g., applicants' specification, page 9, line 18, to page 12, line 14).

Claims 1 and 4, and claims 3 and 7 by virtue of their dependency, describe a method of fabrication that includes forming a lower electrode and then forming a capacitor dielectric film thereon. Claims 1, 3, 4, and 7 further specify the following:

> performing a thermal processing in a hydrogen-content atmosphere after the step of depositing the metal film; and
>
> patterning the metal film to form an upper electrode of the metal film after the step of performing the thermal processing.

That is, thermal processing in a hydrogen-content atmosphere is performed both: (1) *after* depositing a metal film (separate from the formation of the lower electrode); *but* (2) *before* patterning the metal film to form the upper electrode. Neither *Nagel et al.* nor *Won et al.*, either alone or combined, teach or suggest this sequence of steps. It is apparently acknowledged in the Office Action, page 4, top, that *Nagel et al.* does not disclose this subject matter.

Instead, the rejection relies on *Won et al.* to suggest modifying the *Nagel et al.* fabrication method to render the claimed method obvious. However, *Won et al.* does not teach the subject matter missing from the *Nagel et al.* disclosure.

The *Won et al.* fabrication method applies the thermal treatment in the hydrogen atmosphere either before the formation of the upper electrode (see flowchart in Fig. 1) or after the formation of the upper electrode (see flowchart in Fig. 2). *Won et al.* professes that its method reduces the density of the interface trap formed at the interface between the lower electrode and the dielectric film. (Col. 2, lines 58-64.) However, *Won et al.* does not disclose that thermal processing in a hydrogen-content atmosphere is performed both: (1) *after* depositing a metal film (separate from the formation of the lower electrode);[1] *but* (2) *before* patterning the metal film to form the upper electrode.[2] Therefore, *Won et al.* cannot suggest modifying the *Nagel et al.* fabrication method to incorporate this fabrication sequence and thereby render the claimed method obvious. For at least this reason, the obviousness rejection of claims 1, 3, 4, and 7 should be withdrawn.

Claim 5, as amended, and claims 6, 8, and 9 by virtue of their dependency, describe a method of fabrication that includes forming a contact plug electrically connected to the upper electrode in a contact hole. Claims 5, 6, 8, and 9 further specify the following:

> performing a thermal processing in a hydrogen-content atmosphere after the step of forming the contact plug; and
>
> forming an uppermost passivation film over the inter-layer insulating film after the step of performing the thermal processing.

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[1] Fig. 1 of *Won et al.* does not teach that the thermal processing is performed *after* depositing a metal film that is separate from the lower electrode.

[2] Fig. 2 of *Won et al.* does not teach that the thermal processing is performed *before* the formation of the upper electrode.

That is, thermal processing in a hydrogen-content atmosphere is performed both: (1) *after* forming the contact plug (as specifically described in claim 5); *but* (2) *before* forming an uppermost passivation film. As discussed in applicant's specification, such a sequence of fabrication steps can improve the electric characteristics of the capacitor. (See, e.g., page 14, line 26, to page 16, line 15). Neither *Nagel et al.* nor *Won et al.*, either alone or combined, teach or suggest the claimed sequence of steps. Accordingly, the obviousness rejection of claims 5, 6, 8, and 9 should be withdrawn.

Finally, as discussed above with respect to the anticipation rejection of claim 2, *Nagel et al.* does not teach a method for fabricating such that:

> ... conditions of the chemical vapor deposition for forming the lower electrode and the upper electrode are controlled so that an oxygen concentration in the upper electrode is higher than that in the lower electrode.

Applicants note that dependent claims 7-9 include this feature. Because neither *Nagel et al.* nor *Won et al.*, either alone or combined, teach or suggest such subject matter, the obviousness rejection of claims 7-9 should also be withdrawn this additional reason.

In a separate matter, applicants add new claim 10. Because this claim depends from claim 2, it should be allowed for at least the reason of its dependency.

In view of the remarks above, applicants now submit that the application is in condition for allowance. Accordingly, a Notice of Allowability is hereby requested. If for any reason it is believed that this application is not now in condition for allowance, the Examiner is invited to contact applicants' undersigned attorney at the telephone number indicated below to arrange for disposition of this case.

In the event that this paper is not timely filed, applicants petition for an appropriate extension of time. The fees for such an extension, or any other fees which may be due, may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
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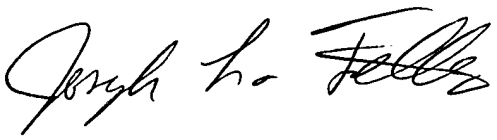

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Enclosure: Petition for Extension of Time

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